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THE NEW BEDFORD REGIONAL AIRPORT:

ESTIMATED REGIONAL ECONOMIC IMPACT OF BUSINESS EXPANSIONS, NEW BUSINESS STARTS, AND BUSINESS RELOCATIONS

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The New Bedford CEO Club

by

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CENTER FOR POLICY ANALYSIS
University of Massachusetts Dartmouth

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TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY iii

1.00 PURPOSE OF THE REPORT 1

2.00 REGIONAL ECONOMIC DEVELOPMENT AND PUBLIC INFRASTRUCTURE: THEORY AND EMPIRICAL FINDINGS 3

3.00 ECONOMIC IMPACT ANALYSIS 11

3.10 Methodology

3.11 Definitions
3.12 Selection of Hypothetical Firms
3.13 Construction of Hypothetical Firms

3.20 Economic Impacts

3.21 Textiles
3.22 Marine Electronics
3.23 Software Manufacturing
3.24 Data Processing
3.25 Parcel Delivery/Courier Services
3.26 Cumulative Economic Impacts

SOURCES CONSULTED 19

APPENDICES A - F

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EXECUTIVE SUMMARY

This report provides an estimate of the potential regional economic impacts that might accrue from proposed improvements to the New Bedford Bedford Regional Airport due to business expansions, spin-offs, start-ups, or relocations. Regional economic impacts are defined as the *annual employment* and *payroll earnings* attributable to new business activity induced by improvements to the New Bedford Regional Airport within a twenty-five mile radius of New Bedford, Massachusetts.

A survey of the literature on public infrastructure and business location decision-making suggest that the following types of businesses are most likely to be attracted by improvements to the Airport:

* Textiles
* Marine Electronics
* Software Manufacturing
* Data Processing
* Parcel Delivery/Courier

If one average-sized firm was to expand, spin-off, start-up, or relocate the total annual regional economic impacts would be:

* Textiles = 140 jobs with annual earnings of $2,263,242

* Marine Electronics = 975 jobs with annual earnings of $25,977,562

* Software Manufacturing = 114 jobs with annual earnings of $4,247,568

* Data Processing = 39 jobs with annual earnings of $863,005

* Parcel Delivery/Courier Service = 53 jobs with annual earnings of $1,330,881

It is estimated that the cumulative economic impacts from new business activity, combined with the regional economic impacts attributable to increased aviation activity, will generate:

* *no less than* 2,079 jobs with annual earnings of $51,605,956.

1.00 PURPOSE OF THE REPORT

The New Bedford Airport Commission adopted a formal mission statement in 1993 establishing the goal that New Bedford Regional Airport (EWB) would become "the aviation hub of Southeastern Massachusetts" (Edwards and Kelcey 1994). Achieving this strategic goal will require the airport to position itself as a regional operations center for a major air freight carrier and as a regional departure and arrival point for commuter passenger traffic. A preliminary passenger, cargo, and economic feasibility study conducted by Sabre Development Technologies, Inc. has identified profitable commuter markets to Philadelphia, Newark, Washington Dulles, Orlando, Palm Beach, Cincinnati, and Cleveland. However, the technical feasibility of capturing these air cargo and passenger markets will require certain physical improvements to the airport that have been detailed in a previous study (Edwards and Kelcey 1994). The proposed physical improvements, especially the extension of Runway 5-23 from 5000 feet to 8000 feet, must be approved by a variety of state and federal agencies including the Federal Aviation Administration, the Massachusetts Aeronautics Commission, the U.S. Environmental Protection Agency, the Massachusetts Department of Environmental Protection, and the U.S. Army Corps of Engineers.

As a first step toward securing the approval of these agencies, the New Bedford Airport Commission employed Edward and Kelcey, Inc. to develop a Phase I Master Plan. The Master Plan surveys existing facilities, as well as historical trends in airport traffic, and forecasts that airport traffic could triple under known scenarios, from 14,600 enplanements in 1992 to 44,174 enplanements by the year 2013. With the extension of runway 5-23 and other physical improvements to support commuter and shuttle air service, total annual enplanements could exceed 100,000 within the same period.[1] Consequently, the Master Plan recommends the expansion New Bedford Regional Airport's capacity to meet forecasted increases in air traffic potential. The Master Plan was accepted by the Federal Aviation Administration on February 24, 1994. The Federal Aviation Administration authorized airport officials to initiate selected components of Phase II Design on May 13, 1994.

The New Bedford CEO Club is an interested party to these developments (Moore 1995) and has requested that the University of Massachusetts Dartmouth Center for Policy Analysis prepare two reports estimating the potential regional economic significance of an expansion in airport capacity. The University of Massachusetts Dartmouth agreed that Dr. Clyde W. Barrow, Director of the Center for Policy Analysis, would serve as principal investigator on the project, pursuant to a formal agreement between the New Bedford CEO Club and the Center for Policy Analysis. The first report was completed in January of 1995 (Barrow 1995). This report operationalized a model developed by the U.S. Department of Transportation for estimating the potential economic significance of aviation-based activity (Butler and Kiernan 1992). could produce total transportation benefits of $9.4 million and total economic impacts of 758 permanent jobs with an annual payroll of $16.9 million. Airport construction activity would produce a total economic impact worth an additional 1,894 jobs and $47 million over a three to five year period.

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[1] For more detailed information on the physical characteristics of New Bedford Regional Airport, as well as the proposed expansions, consult the Phase One Master Plan study (Edwards and Kelcey 1994).

Importantly, the U.S. Department of Transportation's model of economic significance only captures the total impacts of aviation-based activity and, consequently, such estimates are exclusive of any spillover effects that might accrue from additional business expansions, start-ups, or relocations due to augmented comparative advantages. This report is a follow up to the earlier analysis. It is designed to estimate the additional potential economic impacts that might emerge from business expansions, new business start-ups, or business relocations induced by the comparative advantages created by additional airport capacity.

2.00 REGIONAL ECONOMIC DEVELOPMENT AND PUBLIC INFRASTRUCTURE: THEORY AND EMPIRICAL FINDINGS

Among the many instruments available to local policy-makers, the capitalization of public infrastructure has long been considered an effective policy instrument for promoting regional economic development. The term "public infrastructure" often includes a wide range of public expenditures, but for purposes of examining the effect of public investment on economic development, Hansen (1965) classifies public infrastructure into two categories: economic overhead capital (EOC) and social overhead capital (SOC). Public expenditures on economic overhead capital are oriented primarily toward the direct support of productive activities or toward the movement of economic goods and, thus, specifically include expenditures on public works such as roads, streets, bridges, water treatment and distribution systems, irrigation, waterways, airports, seaports, and mass transit. Public expenditures on social overhead capital are designed to enhance human capital and, thus, specifically include expenditures on social services such as education and higher education, job training, public health facilities, fire and police protection.

The consensus among economists is that public infrastructure stimulates private economic activity either by (1) increasing the efficiency of private inputs employed by firms (i.e., capital and labor) or (2) through its direct contribution to production as an input into the production process (Meade 1952). Furthermore, to the extent that either of these hypotheses is correct, public infrastructure should enhance a region's comparative advantage and thus attract additional firms or households which further contribute to a region's economic growth (Eberts 1990, 25). In neo-classical models employing the first assumption, public infrastructure is assumed to be a pure public good that is readily available to any one user without thereby excluding or reducing its utility to other users. In formal terms, public infrastructure is assumed to enter the production function as a factor that augments the productivity of capital and labor, i.e., the private inputs to production. In this model, an increase in the level of public inputs results in increased output for all firms in a region through neutral increases in the efficiency of private inputs. Thus, any firm entering a region benefits immediately from the existing level of public inputs without affecting the benefits received by other firms. Moreover, each private input whose productivity has been augmented by public inputs receives payment equal to the value of its contribution to output and each factor of production receives payments higher than they would receive in the absence of public inputs.

A second model of social investment explains the beneficial effect of public infrastructure from its status as an unpaid factor of production. Public infrastructure is assumed to have private-good characteristics except that is not provided through a market process and thus it is not paid for by users on a per-unit basis. Thus, it is assumed that public infrastructure enters into the production process in the same way as private inputs except that they enter as unpaid factors of production. Unlike the first model, public inputs do not augment the productivity of labor or capital, but instead contribute independently to a firm's output. Since firms, by definition, do not pay directly for the public input on a per-unit basis, they initially earn profits or rents according to the value of the marginal product of the public input. Moreover, this model usually assumes that rents accrue to the ownership factor (i.e., capital). As with a private unpriced input, these profits will attract other firms into an industry or area until the rents are dissipated by a congestion factor (Negishi 1973).[2]

However, despite the widespread theoretical assumption that public infrastructure is an important development tool for regional economic policy-makers, the question of whether public capital investment actually affects private sector output or productivity growth was virtually untested until economists in the Federal Reserve System began a series of empirical studies in the late 1980s.[3] As late as 1990, Randall W. Eberts (1990, 25), an economist at the Federal Reserve Bank of Cleveland, could observe accurately that "economists have only recently begun to assess the effects of infrastructure on regional economic development" beyond its direct impact on construction activity. In fact, Eberts (1986) designed the first study that began to fill this gap by estimating the effect of the public capital stock on regional manufacturing production in a sample of thirty-eight (38) Standard Metropolitan Statistical Areas (SMSAs) from 1958 to 1981. Eberts derived his estimate by entering the public capital stock as an input into a translog production function.[4] Eberts' (1986, 18) findings support the hypothesis that aggregate public capital stocks do make a "significant and positive contribution to manufacturing output." Moreover, a second finding -- that public capital and manufacturing employment are complementary inputs, rather than substitute factors in the regional production function -- indicates "that public capital stock is necessary for future expansion in the manufacturing sector" (Ibid., 19).

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[2] The issue of how public capital enters the production function is best discussed theoretically in the model developed by Takashi Negishi (1973). Negishi assumes that manufacturing firms within a local area purchase local inputs (private capital, K, and labor, L) that when combined with local public capital (G) produces Q, an output that is sold to a national market. Negishi's model thus demonstrates theoretically that if public and private capital stocks are not substitute factors of production, the higher rents accruing to firms due to increased levels of public capital will attract additional firms into the area.

[3] Munnell (1992, 190) observes that "despite its magnitude [$2.7 trillion], public capital had been virtually ignored by the economics profession until the late 1980s." Eberts (1990, 16) points out that one of the main reasons "for the lack of empirical work on the effect of public infrastructure on economic development is the paucity of consistent and accurate measures of infrastructure that are suitable for empirical analysis. Unlike measures of private input usage in manufacturing, there are no reliable and consistent government sources of information on public infrastructure, particularly for individual states and metropolitan areas."

[4] Eberts' (1986, 4-13) definition of public capital stocks was based on the U.S. Census Bureau definition of public capital outlays which include: (a) sanitary and storm sewers and sewage disposal facilities, (b) roadways, sidewalks, and all structures and improvements necessary for their use, such as toll highways, bridges, and tunnels, (c) public hospitals, and (d) public service enterprises, which includes airports and ports.

However, these findings have been challenged on the grounds that aggregate correlations do not necessarily demonstrate whether investment in public infrastructure "causes" regional economic development or merely follows such development as a response to demands created by private investment. To address this problem, Eberts and Fogarty (1987, 3) suggest that "a necessary condition for local public investment to influence economic development is for the formation of public investment to precede the formation of private investment." Such a sequence of events, although not sufficient to document causation in a philosophical sense would, nevertheless, strongly suggest that public infrastructure can be an effective policy instrument for promoting regional economic development. Obviously, if the sequence of events were to occur in the opposite direction (i.e., private investment preceding infrastructure expenditures), then it would be reasonable to argue that local officials merely respond to the location of private economic activity by funding public infrastructure after private investment has created the demand for such infrastructure. Eberts and Fogarty evaluate this sequence by establishing the timing of public infrastructure expenditures and private investment rates for forty (40) Standard Metropolitan Statistical Areas from 1904 to 1978. While the study produced mix results that must be interpreted "with considerable discretion," the overall results of the study "show a dominance of public investment influencing private investment" which, as they note (Eberts and Fogarty 1987, 16-17), is "an important result for the use of public investment as a policy instrument." Interestingly, their results indicate that public infrastructure expenditures tend to lead private investment most frequently in the older urban centers of the Northeast.

As a follow up to studies by Eberts (1986), Eberts and Fogarty (1987), and Aschauer (1989), a more recent series of econometric studies have actually sought to quantify the marginal contribution of public capital investment to overall economic growth by estimating its effect on productivity when considered as an input in a production function equation (Munnell 1990). Alicia Munnell's (1990; 1992, 191) production function equations indicate that nationwide the marginal productivity of public capital expenditures by the federal government is sixty percent (60%); that is, a one dollar ($1) increase in the public capital stock would raise private output by sixty cents ($0.60). Munnell (1990; 1992, 192) also estimated production functions for states and again found that "public capital had a significant, positive impact on output, although the output elasticity was roughly one-half the size of the national estimate."

Munnell's findings are consistent with the estimates of other researchers working with state-level data (Costa et al. 1987; Garcia-Mila and McGuire 1992).[5]

Finally, business location theories of regional development emphasize that economic development depends primarily on geographically-specific locational advantages, whether between nations, states, regions, or cities. The assumption of these models is that firms seek areas which offer greater opportunities for profit and, as already noted, public infrastructure may enhance these opportunities either by increasing productivity or by reducing factor costs. Moreover, the measurable marginal effects on productivity and output suggest that the maintenance and expansion of public infrastructure such as highways, water distribution and treatment facilities, airports, waterways and seaports *should be* important factors in the decision of firms to expand and locate in particular regions (Eberts and Fogarty 1987, 2). Consequently, in the most sophisticated empirical models of business climate, public infrastructure is considered a crucial ingredient in assessing comparative "development capacity" (Corporation for Enterprise Development 1993).

Munnell (1990; 1992, 192) tests this relationship by measuring the average annual change in state employment as a function of production input costs (labor, energy, land), market size, tax burden, and public capital stock. Her results show that even after accounting for all other factors that affect employment, public capital stocks had a positive and statistically significant effect on employment growth. Likewise, Duffy-Deno and Eberts (1991) studied the relationship between public capital stock and per capita personal income in twenty-eight (28) metropolitan areas using a simultaneous equations approach. Results derived from annual data for the years 1980 to 1984 revealed that public capital stock also has a positive and statistically significant effect on per capita personal income. A study of the effects of public works investments on the growth of real income found that public works infrastructure accounted for thirty percent (30%) of the gain in real income over a three year period in 195 small Missouri municipalities (CONSAD Research Corporation 1969). The findings of Duffy-Deno and Eberts (1991) indicate that the observed effects on income come through two channels: (1) the actual construction of publicly-owned facilities and (2) the use of public capital as an unpaid factor in the production process (i.e., its marginal effect on costs and productivity).

Thus, even though most empirical research on the topic is of relatively recent origin, there seems little doubt that "the importance of public capital for regional growth stems from its effect on the production and location decisions of private industry" (Duffy-Deno and Eberts 1991, 329). Importantly, however, public infrastructure is only one consideration among many that goes into determining a region's comparative attractiveness for business and industry. A region's business climate depends on numerous factors that are often beyond the control of local policy-makers such as weather, location relative to a firm's market, local wage rates, access to specialized skills, capital markets, and permitting processes or corporate tax rates established by the state and federal governments.

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[5] Biehl (1980) identifies the provision of adequate infrastructure as a major reason for regional income disparities. Thus, he concludes that the provision of adequate infrastructure is central problem in regional economic development strategy.

Once again, the attempt to actually quantify and document exactly what factors play a predominant role in business location decisions is of relatively recent origins. Nevertheless, several reputable works on the subject have documented three findings with reasonable certainty. First, virtually all scholarly studies of business location decisions document that infrastructure is a far more important locational consideration that local tax levels or local financing subsidies (Carlton 1977; Stafford 1979; Schmenner 1982; Hekman 1982; Tannenwald 1993, 1994). In other words, in a local community with inadequate infrastructure investment, the small comparative advantage offered by low property tax rates or tax abatements will be more than offset by the comparative loss of marginal efficiencies resulting from inadequate infrastructure.

Second, the majority of companies making location decisions usually elect to expand on-site rather than to relocate or to expand plant facilities elsewhere. Stafford's (1979) study found that sixty percent (60%) to eighty percent (80%) of all new manufacturing capacity each year is allocated to the expansion of existing plants and only twenty percent (20%) to forty percent (40%) to the construction at new locations. An important implication of this finding is that public capital expenditures of any type are likely to have the greatest overall impact on permanent job creation when these expenditures support the development of a region's *existing* economic base. Indeed, even though the decision to stay in place is not always the most efficient locational choice, firms will frequently select the "less rational" option in order to minimize management disruption, especially if local communities can allay doubts about whether public infrastructure will be able to accommodate additional production at *reasonable cost* (i.e., not necessarily the lowest or most efficient cost).

Third, business location decisions are made sequentially over a period of time. A firm will first make a choice about what regions or states it will consider; then, it will narrow its choice to an individual community and, finally, to a specific site. In the initial phase of a business location decision a company is selecting what region of the country (e.g., the South, Mid-West, or New England) offers the most suitable location. In this phase, public works infrastructure is a less important consideration than factors such as the availability of a suitable workforce (e.g., education levels, university, job training programs) and other factors that are largely beyond the control of local or regional policy-makers. Schmenner (1982) hypothesized that the low rating of infrastructure in the initial choice probably reflects the basic comparability of infrastructure across the United States; that is, high-quality infrastructure is more or less widely available throughout the United States so that business executives can assume that superhighways, airports, and wastewater treatment facilities will be found in comparable quality in every region of the country. However, once an initial decision has narrowed the potential sites down to a particular state or states, then public infrastructure becomes a key determinant of which communities will be considered seriously in the selection process, i.e., public infrastructure can make the difference between whether a firm chooses to locate in New Bedford, Massachusetts or Jacksonville, Florida (Schmenner 1982, 147-50). Thus, Schmenner's (1982) analysis suggests that infrastructure is a more important consideration in selecting particular communities or sites.

Furthermore, even though the empirical evidence is still preliminary, there is reasonable cause to believe that the inducement effects of different types of public infrastructure are different for different types of industry. On this point, Eberts (1986, 19) observes "that previous research suggests that specific types of public infrastructure may have more noticeable effects on the output of specific sectors in regions with differing characteristics." In particular, the existing empirical evidence suggest three conclusions. First, public investment in communications and transportation infrastructure appears to have the most significant effect on regional growth (Looney and Frederiksen 1981; Mera 1973). Notably, for purposes of this study, a recent cost-benefits study by the Congressional Budget Office (1991, 35-38) finds that the most profitable public investment opportunities available at this time are to be found in outlays for air traffic control and airport capacity expansions.[6] Second, in the United States, public investment in infrastructure tends to have a greater effect on economic activity in distressed cities than in growth cities (Eberts and Fogarty 1987). Third, public investment in infrastructure tends to lead private investment and development activity in older urban centers in the Northeast, while it tends to follow private investment and growth activity in the South and West (Eberts and Fogarty 1987).[7] Each of these general conclusions points favorably toward approving and funding the airport capacity expansion proposed for the New Bedford Regional Airport.

Unfortunately, most empirical studies of the effects of public infrastructure on business location decisions have tended to concentrate on the importance of interstate highway systems or on measurements of total road mileage within a state (Bartik 1985). Not surprisingly, empirical studies have concentrated on this type of economic overhead capital, partly because empirical studies of business location decisions have focused on the locational decisions of manufacturing firms. The importance to manufacturing production of bulky and heavy inputs and of shipping final products to market places a premium on locating factories near good transportation systems, especially railroads and interstate highway systems. However, there is some preliminary evidence that airports fill this same niche in the case of some high technology and service firms (Bamberger et al. 1985, 5-6). For instance, the production activities of high technology firms, particularly software manufacturers, involve products with a high value to weight ratio. Thus, high quality air service is well suited to the needs of high technology firms because many high-tech goods can be shipped efficiently by air freight. Likewise, research and development activities, and other business services often place a premium on frequent communications, rapid service, and information exchange between individuals separated by wide distances. The access to air transportation and to air courier services can be far more important to these firms than highway transportation or rail service.

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[6] Cf. Winston (1991) estimates that $1.5 billion in runway investments would optimize airport capacity utilization in the United States. He further estimates that an investment of $1.5 billion in runway capacity improvements would yield annual benefits of $11 billion for several years -- clearly a high rate of return on public investment.

[7] Eberts (1986, 5) finds that "public outlays are more likely to influence private investment decisions in cities that experienced much of their growth before 1950." Thus, he concludes that "public investment appears to be the initiating factor in the development process rather than the passive or accommodating factor" in older cities located in the Northeast.

3.00 ECONOMIC IMPACT ANALYSIS

3.10 Methodology

3.11 Definitions

Economic impacts measure the regional importance of a particular firm, industry, or economic activity, primarily in terms of the employment and payroll generated by that firm, industry, or economic activity. Economic impacts consist of direct impacts, indirect impacts, induced impacts, and total impacts. *Direct impacts* are consequences of economic activities carried out *in situ* by a particular firm or firms. *Indirect impacts* derive primarily from off-site economic activities that are attributable to a particular firm or firms such as business travel, business services, and supplier activity. *Induced impacts* are the multiplier effects of the direct and indirect impacts. The latter account for increases in employment and incomes over and above the combined direct and indirect impacts that are created by successive rounds of spending.[8] *Total impacts* are the sum of direct, indirect, and induced impacts.

3.12 Selection of Hypothetical Firms

For the purposes of this study, an attempt has been made to identify the types of firms that are most likely to regard airport facilities as a significant factor in decisions to expand, start-up, or relocate to southeastern Massachusetts. The identification of these hypothetical firms is derived from the general theoretical conclusions adduced from the literature survey in section 2.00, while taking into consideration the existing economic base of southeastern Massachusetts, the region's economic development history, and the state's strategic economic development plan. These factors suggest that improvements to New Bedford Regional Airport are likely to offer the greatest marginal attraction to firms in textiles, marine electronics, software manufacturing, data processing or "back office" billing operations, and parcel delivery/courier services.

The state's strategic economic development plan (Weld et al. 1993) is based on a concept of sectoral clustering (Porter 1991; Stenberg 1991). The concept of sectoral clustering is derived from the observed empirical tendency for similar-type firms to concentrate geographically in particular regions. When similar-type firms locate near one another, they benefit from the "agglomeration effects" of concentration. These effects include the benefits of shared technology, the ability to draw on a well-developed and specialized workforce, the benefits conferred by horizontal mobility within the workforce which allows ideas and technical innovations to move quickly from firm to firm, cooperative market-niche strategies, and inter-firm production networking. Likewise, specialized public infrastructure, capital markets, and business services are more likely to emerge amid sectoral clusters and these, in turn, make the region even more attractive to the same type firms. Consequently, cluster theory suggests that regional development strategies are more likely to succeed when they provide support and inducements to expand, start-up, spin-off, or attract firms similar to the ones in a region's core clusters. A recent *Target Industry Analysis* (RKG Associates, Inc. 1993) prepared for the New Bedford Department of Planning and Economic Development adopts the same premise by suggesting that industries targeted for local development should engage in business activities similar to or complementary to those of existing regional clusters.

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[8] For example, most of the take-home income earned by the employees of a particular firm (A) is spent locally. Some of this spending becomes income to other local individuals B (both business owners and employees) who provide products and services to the employees of firm (A). Subsequently, part of these second round incomes (B) are also spent locally and thus become income to another set of individuals (C). As successive rounds of spending occur, additional income is created or induced in the local area.

In general, manufacturing accounts for twenty-three percent (23%) of all employment in southeastern Massachusetts, compared with the statewide average of seventeen percent (17%). More notably, manufacturing accounts for thirty-three percent (33%) of all private employment in New Bedford and for thirty-five percent (35%) of total private employment in Fall River (Weld et al. 1993, 167).

First, New Bedford and Fall River both have significant concentrations of textile firms (Ibid., 167; RKG Associates, Inc. 1993, 7, 11). In 1991, the textile firms in southeastern Massachusetts employed 4,921 people and these firms are uniquely qualified to compete nation-wide and internationally through the application of advanced technologies. The most competitive textiles firms in southeastern Massachusetts are highly automated and draw on a talented pool of skilled labor that has been trained and developed over several decades (Weld et al. 1993, 168; Primack 1993). Thus, consistent with the basic premises of cluster theory, New Bedford's *Target Industry Analysis* recommends that the City promote the diversification of its existing textile industry base (RKG Associates, Inc. 1993, 11).

Second, the state's strategic economic development plan concludes that southeastern Massachusetts is also well-positioned to "benefit from new areas of potential growth such as marine electronics and sciences" (Weld et al. 1993, 167). The New Bedford *Target Industry Analysis* reinforces this conclusion with its suggestion that New Bedford capitalize on its maritime assets wherever possible by focusing on marine-related industrial activities. Notably, these recommendations build on a little recognized regional strength. The electronics manufacturing sector is already the single largest manufacturing employer in southeastern Massachusetts based on two-digit Standard Industrial Classification Codes. In 1991, firms engaged in the manufacture of electronics and other electrical equipment employed 10,730 persons in southeastern Massachusetts (Ibid., 169). Fifty-six marine electronics firms were operating in Massachusetts as of 1990 and twenty-five of them (i.e., forty-six percent) were based in southeastern Massachusetts (Hogan, Georgianna, and Huff 1991, 20). Moreover, the New Bedford Regional Airport's Foreign Trade Zone may prove particularly attractive to such firms, since electrical equipment and electronics products were, respectively, the third and fourth most frequently imported products received into general purpose foreign trade zones in the United States. Electrical equipment and electronics products accounted for approximately 18% ($1.5 billion) of all products of foreign origin received into U.S. general purpose foreign trade zones (Sabre Development Technologies, Inc. 1995, I-1).

Third, it has been suggested in the public infrastructure literature that software manufacturers are attracted to low-cost airports because of the high value to weight ratio of software products. In at least one instance, moreover, a computer diskette manufacturer (i.e., Dysan) has actively considered locating a research and development or manufacturing facility in the region. Fourth, there are also strong economic arguments that support locating "back office" operations in the Greater New Bedford area. Labor cost, labor availability, space availability, rents, and land costs all offer economic inducements to locate operations such as data processing and back office billing in the area. In addition, the region's proximity to corporate headquarters in New York, southwestern Connecticut, or even Boston facilitate field management of these operations, particularly if one adds reliable commuter air service. In Fall River, the overall business costs of back office operations are less than ninety percent (90%) of the costs incurred for same-type operations in the three-hundred-twenty (320) metropolitan areas (MSAs) in the continental United States. Recently, State Street Bank opted to locate a major back office operations center in Tampa Bay, Florida, rather than southeastern Massachusetts, partly because of Tampa Bay's superior air service facilities.

Finally, it is assumed that improved air cargo services and business expansions in the vicinity of the airport will generate additional parcel delivery and local courier services as a natural spin-off to airport improvements.

3.13 Construction of Hypothetical Firms

To derive a reasonable, but minimal, estimate potential economic, it is assumed that one average-sized firm in each of five industries identified above will expand, spin-off, start-up, or relocate, partly as a result of the locational advantages offered by scheduled commuter air service and air cargo service. The average size of firms operating in each industry were derived by dividing the total number of such firms operating in Massachusetts by the total number of persons employed by such firms. The employee mix of an average firm operating in each industry was estimated using occupational staffing data from the Massachusetts Department of Employment and Training's, *The Job Guide: Occupational Staffing*

Patterns of Massachusetts Industries (1993, Volume 1). The annual earnings for different occupations within each industry were estimated using earnings data from the Massachusetts Department of Employment and Training's, *Selected Occupational Wages* (1993, Vols. 1-2). The estimated payroll of an average firm operating in each industry was derived by multiplying the number of employees in each occupation by the annual earnings of that occupation to arrive at a weighted annual payroll. In two cases, back office operations and parcel delivery services, the small average size of firms yielded fractional employees in some occupations when the average number of employees was divided by the employee mix percentages. In these two cases, the fractions were rounded up to one in order to establish the employee size and payroll of a "typical" firm operating in Massachusetts.

The result of these calculations yield an estimate of direct economic impacts in terms of employment and annual earnings.[9] The induced and total impacts of the hypothetical firms can be estimated by applying the RIMS II direct-effect multipliers to the data on direct economic impacts. RIMS II multipliers are intended to show the total regional effects on industrial output, personal earnings, and employment for any county or group of contiguous counties in the United States resulting from a particular business activity. The RIMS II total direct-effect multipliers estimate the *total* change in regional output, earnings, and employment resulting from direct earnings and employment in a particular industry. Thus, the RIMS II total direct-effect multipliers implicitly capture induced effects which can be calculated as total impacts minus direct impacts.

3.20 Economic Impacts

3.21 Textiles

The average textile firm in Massachusetts has forty-seven (47) employees with an annual payroll of $846,705. The average annual earnings of an individual employed by one of these firms is $18,015 (See Appendix A). The total regional economic impact of such a firm, including indirect and induced impacts, would generate one-hundred-forty jobs (140) with an estimated annual payroll of $2,263,242 (See Table 1).

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[9] Direct impacts typically include the direct effects of "local expenditures" on the regional economy, such as utilities, motor vehicle fuel, materials, and business services. Ideally, such data would be obtained from a statewide survey of employers in the five industries. It is unfeasible to obtain such data for purposes of this study, and no reliable estimates of local expenditures were readily available on a consistent basis. Consequently, these estimates understate the potential impacts considerably, because they do not include the impacts of local expenditures.

3.22 Marine Electronics

The average marine electronics in Massachusetts has three-hundred-eighty-one employees with an annual payroll of $11,802,618. The average annual earnings of an individual employed by one of these firms is $30,978 (See Appendix B). The total regional economic impact of such a firm, including indirect and induced impacts, would generate nine-hundred-seventy-five (975) jobs with an estimated annual payroll of $25,977,562 (See Table 1).

3.23 Software Manufacturing

The average software manufacturing firm in Massachusetts has forty-seven employees with an annual payroll of $1,753,382. The average annual earnings of an individual employed by one of these firms is $37,306 (See Appendix C). The total regional economic impact of such a firm, including indirect and induced impacts, would generate one-hundred-fourteen (114) jobs with an estimated annual payroll of $4,247,568 (See Table 1).

3.24 Data Processing and Back Office Billing Operations

The average data processing firm in Massachusetts has twenty employees with an annual payroll of $504,108. The average annual earnings of an individual employed by one of these firms is $25,209 (See Appendix D). The total regional economic impact of such a firm, including indirect and induced impacts, would generate thirty-nine (39) jobs with an estimated annual payroll of $863,005 (See Table 1).

3.25 Parcel Delivery/Courier Services

The average parcel delivery/courier service in Massachusetts has thirty-one employees with an annual payroll of $689,254. The average annual earnings of an individual employed by one of these firms is $22,234 (See Appendix E). The total regional economic impact of such a firm, including indirect and induced impacts, would generate fifty-three (53) jobs with an estimated annual payroll of $1,330,881 (See Table 1).

3.26 Cumulative Economic Impacts

The proposed physical improvements to New Bedford Regional Airport have an estimated minimum capacity to create and induce an additional 1,321 jobs with a total annual payroll of $34,682,258 (1994 dollars) through business expansions, spin-offs, start-ups, and relocations. The potential regional economic impacts assessed in this report accrue in addition to the potential impacts attributable to aviation and aviation-related activities. In a previous report, the latter impacts were estimated at 758 jobs with a total annual payroll of $16,923,698 (Barrow 1995). The results of the two analyses suggest that capacity expansions at New Bedford Regional Airport will produce minimum total regional economic impacts of 2,079 permanent jobs with a total annual payroll of $51,605,956 (See Table 1).

TABLE 1

POTENTIAL ECONOMIC IMPACTS RESULTING FROM IMPROVEMENTS TO NEW BEDFORD REGIONAL AIRPORT

ECONOMIC IMPACTS Of Avg. Firm In:	EARNINGS	EMPLO	MULTIPLIER		INDUCED IMPACTS		TOTAL IMPACTS	
			Earnings	Employment	Earnings	Employment	Earnings	Employment
TEXTILES	$846,705	47	2.6730	2.7484	$ 1,416,537	93	$ 2,263,242	140
MARINE ELCTRNCS	$11,802,618	381	2.2010	2.5581	$14,174,944	594	$25,977,562	975
CUMULATIVE	**$12,649,323**	**428**			**$15,591,481**	**687**	**$28,240,804**	**1,115**
SOFTWARE MFG.	$ 1,753,382	47	2.4225	2.3660	$ 2,494,186	67	$ 4,247,568	114
CUMULATIVE	**$14,402,705**	**475**			**$18,085,667**	**754**	**$32,488,372**	**1,229**
DATA PROCESSING	$ 504,180	20	1.7117	1.9241	$ 358,825	19	$863,005	39
CUMULATIVE	**$14,906,885**	**495**			**$18,444,492**	**773**	**$33,351,377**	**1,268**
DELIVERY/COURIER	$ 689,254	31	1.9309	1.6931	641,627	22	$ 1,330,881	53
CUMULATIVE	**$15,596,139**	**526**			**$19,086,119**	**795**	**$34,682,258**	**1,321**
AVIATION IMPACTS[a]	$ 9,864,514	427			$ 7,058,184	331	$16,923,698	758
CUMULATIVE	**$25,460,653**	**953**			**$26,144,303**	**1,126**	**$51,605,956**	**2,079**

NOTES: [a]See Barrow (1995) for documentation of aviation-related economic impacts.

SOURCES: Direct-effect multipliers from U.S. Department of Commerce, *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II)* (Washington, D.C.: Government Printing Office, 1992), p. 24.

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APPENDIX A

Appendix A: Textiles

Average Size	47			
Average Wage	$18,015 (weighted average)			
Wages Per Unit	$846,705			
Employee Mix		**Total Wages**	**Empl. % of Industry**	**# Emplys. Per Firm**
	Sewing Mach. Oper., Garment	$18,138	43.7	21
	Sewing Mach. Oper., Non- Garment	$13,395	11.0	5
	All Other Helper, Laborer, Mover	$17,659	4.6	2
	Pressing Mach.. Oper., Textiles	$13,811	4.5	2
	Sewers, Hand	$13,395	3.5	2
	Cutters & Trimmers, Hand	$14,934	3.5	2
	Hand Packers and Packagers	$16,245	3.0	1
	General Managers and Top Exec.	$47,033	3.0	1
	Traffic, Shipping, & Rec. Clerks	$18,548	3.0	1
	Text. Drawout & Wind. Mach. Ops.	$16,182	2.7	1
	Freight & Material Movers, Hand	$17,659	2.2	1
	Bookkeeping & Account & Auditing	$21,850	2.0	1
	All Other Assemblers, Fabricator	$14,539	2.1	1
	All Other Sales & Related Occ.	$31,170	1.9	1
	Patternmaker, Layout Workers, Fab	$13,811	1.7	1
	All Other Hand workers	$13,603	1.8	1
	Pressers, Hand	$13,811	1.6	1
	Stock Clerks: Stockroom & Ware.	$19,093	1.4	1
	Industrial Machinery Mechanics	$26,811	1.4	1
	General Office Clerks	$17,310	1.2	1

APPENDIX B

Appendix B: Marine Electronics

Average Size	381	
Average Wage	$30,978	(weighted average)
Wages Per Unit	$11,802,618	

Employee Mix	Wage	Empl. % of Industry	# Emplys. Per Firm
Electrical, Electronic Assembler	$20,946	13.9	53
Electrical & Electronic Engineer	$45,582	8.7	33
Electrical, Electronic Assembler	$20,946	8.2	31
All Other Assemblers, Fabricator	$19,406	7.8	30
Electrical & Electronic Technician	$31,296	7.6	29
Industrial Production Managers	$38,375	4.5	17
A/O Engineer Technicians	$44,945	4.3	17
Electronic Semiconductor	$26,811	4.2	16
All Other Sales & Related Occ.	$31,170	3.6	14
All Other Secretaries	$20,997	3.4	13
Electromechanical Eq. Assembler	$21,070	3.4	13
Engineer, Math, Nat. Sci. Mngr.	$44,945	3.1	12
General Managers and Top Exec.	$47,033	3.1	12
Industrial Engineers, Exc. Safety	$44,945	2.9	11
All Other Engineers	$44,945	2.6	10
Production, Expediting Clerks	$21,070	2.3	9
Marketing, Adv, Public Rel. Mngrs.	$41,862	2.2	9
Mechanical Engineers	$39,409	2.2	9
Drafters	$22,877	2.2	8
Systems Analysts & Computer Sci.	$36,911	2.0	7
All Other Management Support Wks.	$35,654	1.7	6
Coil Winders, Tapers, Finishers	$19,801	1.6	6
Financial Managers	$44,654	1.5	6
Machinists	$26,811	1.5	6
Solderers and Brazers	$19,801	1.5	6

APPENDIX C

Appendix C: Software Manufacturing

Average Size	47	
Average Wage	$37,306	(weighted average)
Wages Per Unit	$1,753,382	

Employee Mix	Wage	Empl. % of Industry	# Emplys. Per Firm
Electrical & Electronic Engineer	$45,582	19.4	9
Engineer, Math, Nat. Sci. Mgr.	$44,945	7.8	4
All Other Secretaries	$20,997	7.3	3
Systems Analysts & Computer Sci.	$40,889	6.8	3
Industrial Production Managers	$38,375	5.9	3
All Other Sales & Related Occ.	$31,170	4.9	2
All Other Engineers	$44,945	4.5	2
All Other Mngmnt. Support Workers	$20,997	4.1	2
Electrical & Electronic Techn.	$31,296	3.9	2
Electrical, Electronic Assemblers	$20,946	3.7	2
Marketing, Adv., Public Rel. Mngrs.	$41,862	3.5	2
A/O Engineer Technicians	$44,945	3.3	2
Financial Managers	$44,654	3.1	1
Accountants and Auditors	$33,442	2.7	1
Industrial Engineers, Exc. Safety	$38,898	2.7	1
Personnel, Train., Labor Rel. Spec.	$44,616	2.4	1
Production, Expediting Clerks	$21,070	2.4	1
Mechanical Engineers	$39,409	2.1	1
Personnel, Trng., Labor Rel. Mngr.	$44,616	2.0	1
All Other Mangrs. & Admin.	$35,654	1.7	1
Computer Programmers & Aides	$30,283	1.6	1
Budget Analysts	$35,521	1.5	1
Writers, Editors, Incl. Technical	$35,469	1.3	1
Computer Operators, Exc. Periph.	$21,926	1.4	1

APPENDIX D

Appendix D: Data Processing and Back Office

Billing Operations

Average Size	16	
Average Wage	$25,209	(weighted average)
Wages Per Unit	$403,344	
Total Employees	20	
Total Payroll	$504,180	

Employee Mix		Wage	Empl. % of Industry	# Emplys. Per Firm
	Bill and Account Collectors	$21,020	27.3	4
	All Other Sales & Rel. Occ.	$31,170	7.6	1
	General Office Clerks	$17,310	7.1	1
	Adjustment Clerks	$20,451	6.7	1
	Bill, Post, Calculate Mach. Op.	$20,451	6.7	1
	Financial Managers	$44,654	6.3	1
	General Mngrs. & Top Exec.	$47,033	5.0	1
	First Line Supervisors, Cler.	$25,297	4.6	1
	All Other Secretaries	$20,997	4.6	1
	Bookkeeping & Accnt & Aud.	$21,850	3.8	1
	Data Entry Keyers, Ex. Comp.	$17,876	3.4	1
	Marketing, Pblc Rel. Mngrs.	$41,862	2.9	1
	Credit Analysts	$33,442	2.9	1
	Other Mngmnt. Support Wks.	$20,997	2.9	1
	Typists, Incl. Word Proc.	$20,559	2.9	1
	Credit Checkers	$20,451	2.5	1
	File Clerks	$16,633	2.5	1

APPENDIX E

Appendix E: Parcel Delivery / Courier Service

Average Size	21	
Average Wage	$22,234	(weighted average)
Wages Per Unit	$466,914	
Total Employees	31	
Total Payroll	$689,254	

Employee Mix	Wage	Empl. % of Industry	# Emplys. Per Firm
Truck Drivers, Light & Heavy	$19,500	47.8	10
Hand Packers and Packages	$16,245	7.3	2
General Mngrs. & Top Execs.	$47,033	5.2	1
All Other Secretaries	$20,997	3.4	1
All Other Sales & Related Occ.	$31,170	3.2	1
General Office Clerks	$17,310	3.2	1
All Other Helper, Laborer, Mover	$17,659	3.2	1
Bus, Truck, Diesel Eng. Mechanic	$29,702	3.1	1
Industrial Truck & Tractor Oper.	$21,382	2.5	1
Comm., Transp., Util Mngrs.	$28,000	2.4	1
Bookkeeping, Account, & Auditing	$21,850	2.1	1
Computer Prog. & Aides	$30,283	2.0	1
Billing, Cost & Rate Clerks	$20,451	2.0	1
First Line Supervisors, Clerical	$25,297	1.9	1
Adjustment Clerks	$22,209	1.9	1
Dispatcher: Exc. Pol., Fire, Amb.	$18,548	1.9	1
Stock Clerks: Stockroom & Ware.	$19,093	1.7	1
Systems Analysts & Comp. Sci.	$40,889	1.3	1
Traffic, Shipping & Rec. Clerks	$18,548	1.3	1
Maintenance Repairers, Gen. Util.	$21,840	1.2	1
Refuse Collectors	$16,161	1.2	1

APPENDIX F

APPENDIX F
NEW BEDFORD ECONOMIC PROFILE

The City of New Bedford has a population of 96,892 (est. 1992). The New Bedford economy has been anchored by manufacturing and fishing industries for more than a century. In 1985, for example, manufacturing employment accounted for 43.4% of total employment in New Bedford, whereas manufacturing accounted for only 21.1% of total employment statewide in Massachusetts. As a result, New Bedford and the entire southeastern Massachusetts region have been hit particularly hard by declines in manufacturing employment over the last decade. Between 1985 and 1994, total employment in New Bedford declined by 22.3% from 47,352 to 36,779. Even during the recent economic recovery, total employment levels have recovered only marginally to 38,477 (January 1995). The exceptional erosion of New Bedford's manufacturing base accounts for a significant portion of this decline. Between 1985 and 1991, manufacturing employment fell by 39% from 20,528 to 12,580.

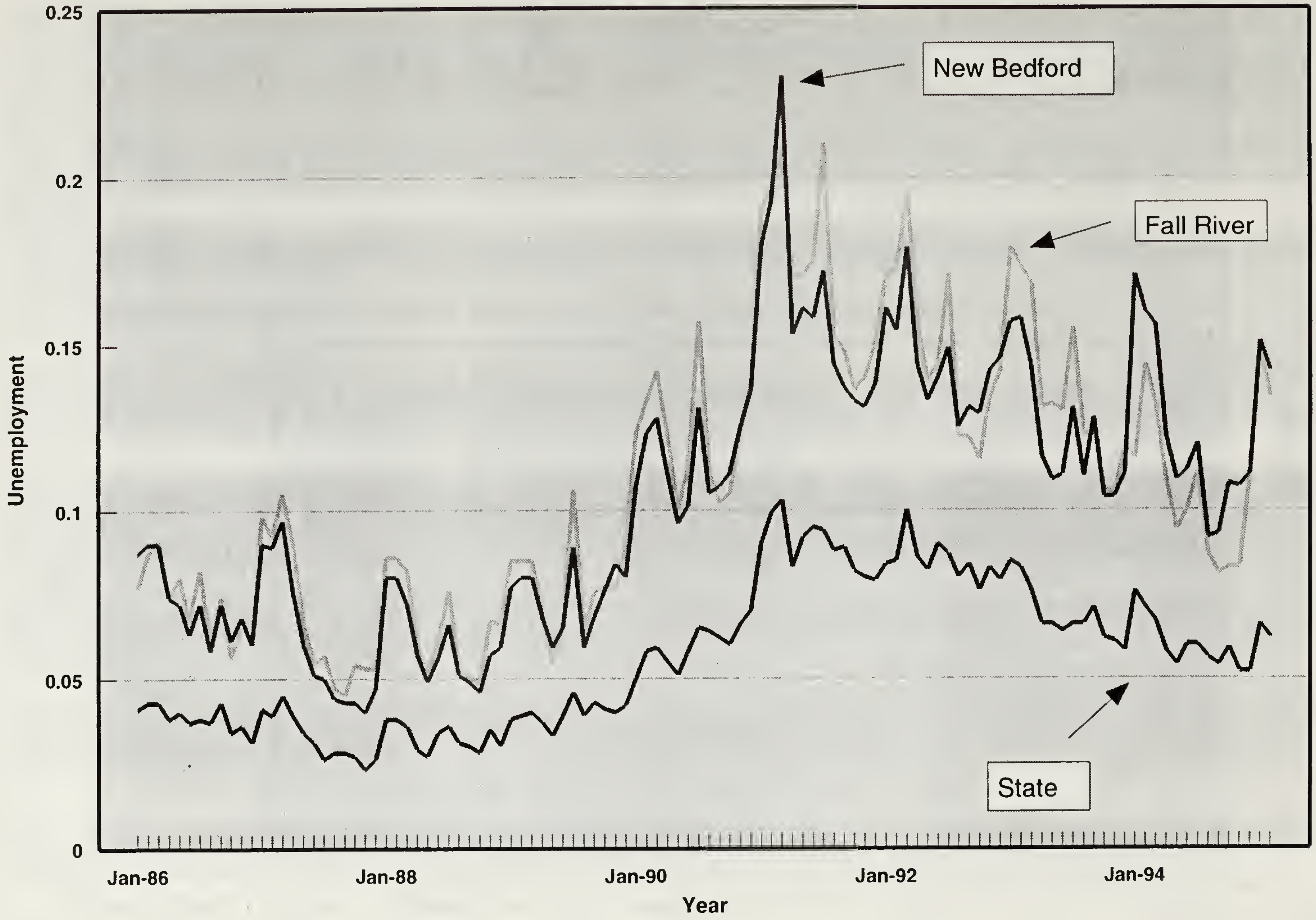
As a manufacturing center, employment in New Bedford has always been sensitive to fluctuations in the business cycle and this instability is compounded by a history of unemployment that persistently exceeds statewide averages over the course of the business cycle. Typically, New Bedford's unemployment rate ranges from 50% above statewide unemployment levels during business cycle peaks to 100% above statewide unemployment averages during business cycle troughs. This employment gap seems to have grown wider since the last recession. New Bedford's unemployment rate has dipped below 10% only once in the last five years (May 1990) and it presently stands at 14.2% (February 1995) compared to a statewide unemployment rate of only 6.2%.

One consequence of economic instability and high unemployment is that New Bedford and the surrounding region are in chronic economic and social distress. Median household income in New Bedford is $22,647, or only 54.3% of the statewide median household income of $41,678, which ranks 345th lowest among the 351 municipalities in Massachusetts. Similarly, per capita income in New Bedford is $10,923, or only 61.4% of statewide per capita income of $17,801, which ranks 350th among the state's 351 municipalities. New Bedford's poverty rate is one of the highest in New England with 23.7% of the City's residents living below the official (BLS) poverty level. Approximately 1 in 9 (11%) of New Bedford's residents live in subsidized public housing, while 17.1% of City residents receive some type of public assistance (compared to the statewide average of 7.7%).

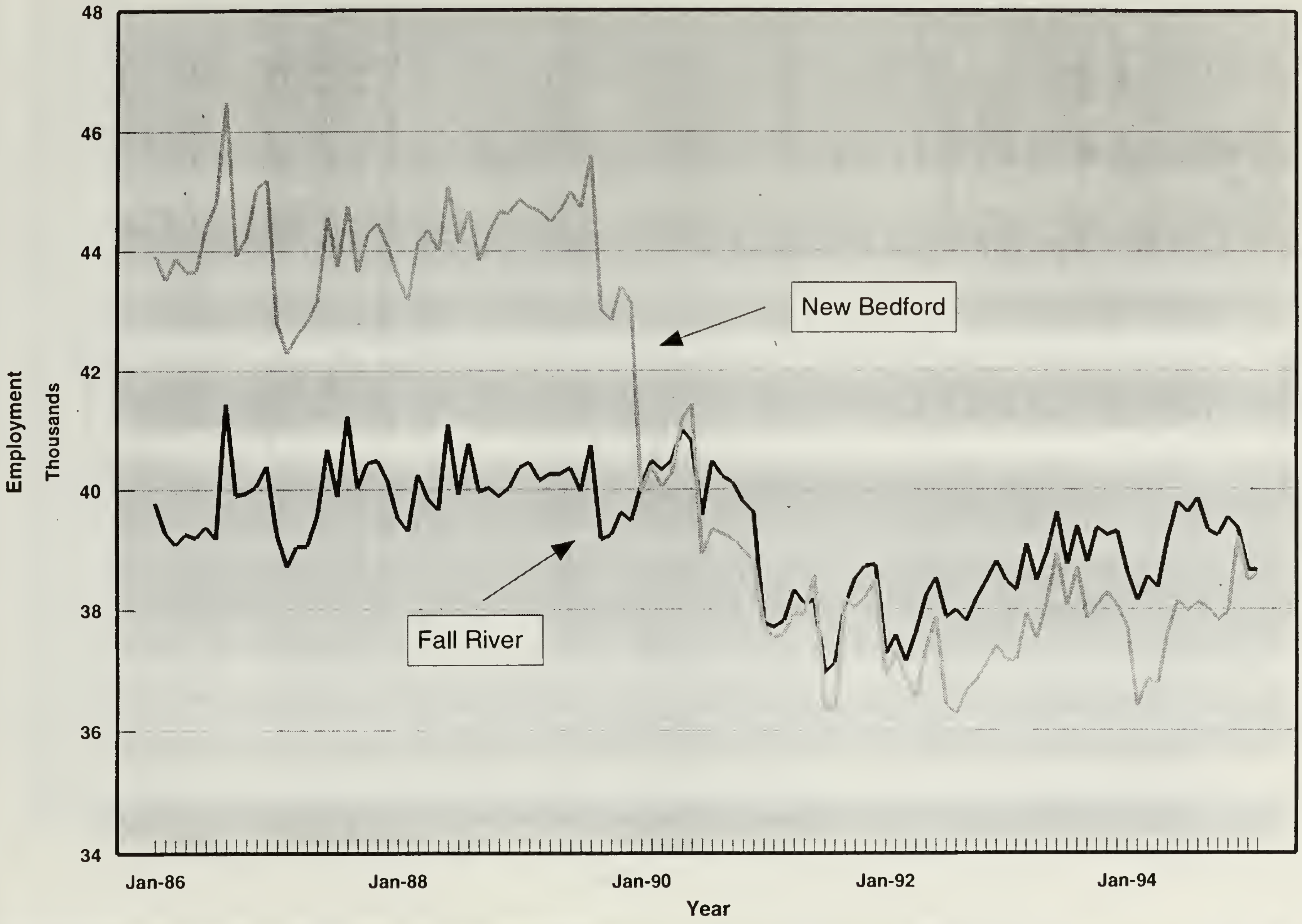
Likewise, less than one-half (49.7%) of New Bedford's residents age 25 and older have a high school diploma compared to the statewide average of eighty percent (80%). This is among the lowest rates of educational achievement in the state even when compared to other distressed urban centers such as Lowell (65.8%), Springfield (69.6%), and Worcester (72.9%). Moreover, New Bedford continues to have a high school dropout rate of 21.5% (residents age 16-19) compared to a state average of 8.5%. Partly as a result, only 6.9% of the City's residents have a bachelor's degree or better compared to 27.2% statewide.

Finally, this combination of high unemployment, low income, and low education has placed severe limits on New Bedford's own-source fiscal capacity. The City of New Bedford has equalized assessed property values of $31,430 per capita (1993) compared to a statewide average of $59,046 per capita. For comparison, therefore, New Bedford has an own-source fiscal capacity that is only 53% of the statewide average and 348th lowest among the state's 351 municipalities.

Unemployment: State, Fall River, New Bedford - Jan. 1986 to Feb. 1995

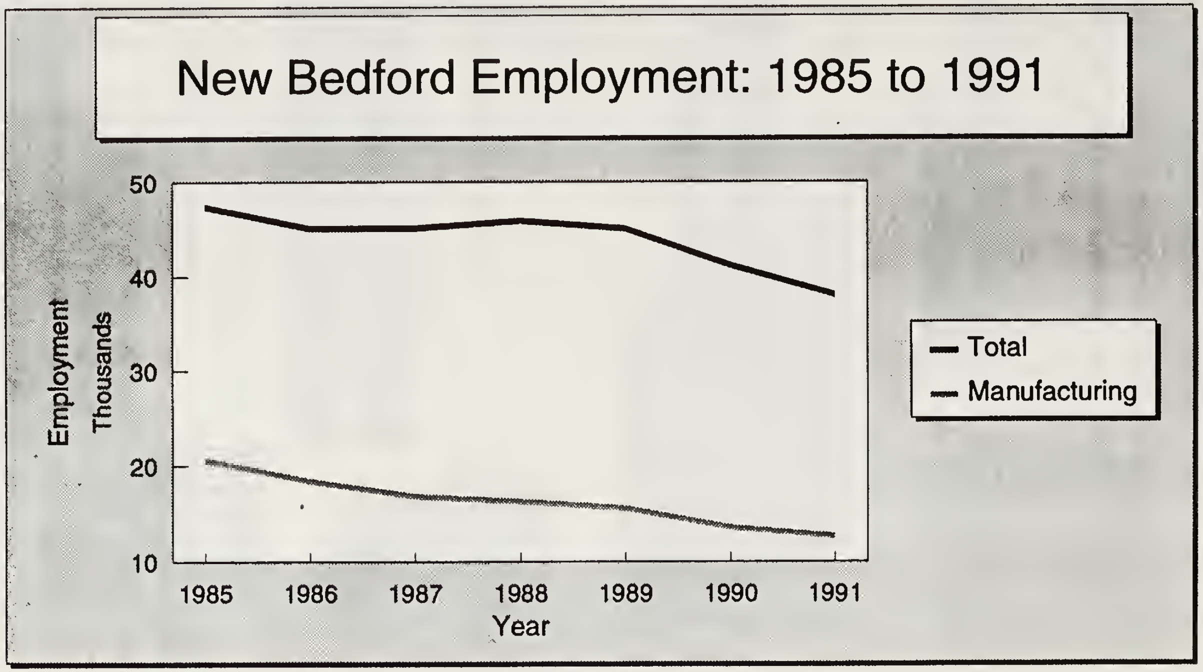


Employment: Fall River and New Bedford - Jan. 1986 to Feb. 1995



New Bedford has experienced a steady decline in jobs, particularly in the manufacturing sector.

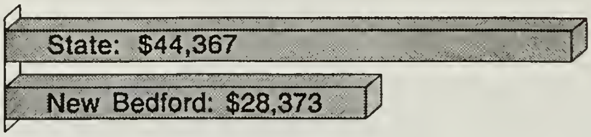
Year	Total Employment	Manufacturing
1985	47,352	20,528
1986	45,060	18,325
1987	45,067	16,742
1988	45,845	16,202
1989	45,017	15,470
1990	41,121	13,517
1991	37,979	12,580


New Bedford Employment: 1985 to 1991

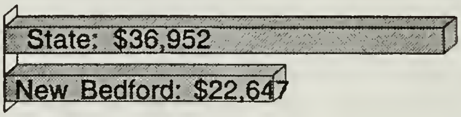
Source: State Department of Employment and Training ES-202 File

State Comparisons

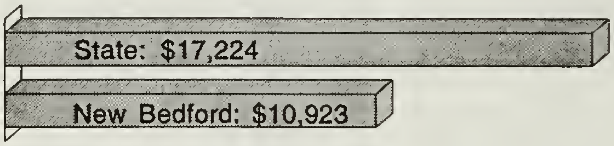
Median Family Income (earned by people living together who are related)



Median Household Income (earned by people living together who may or may not be related)

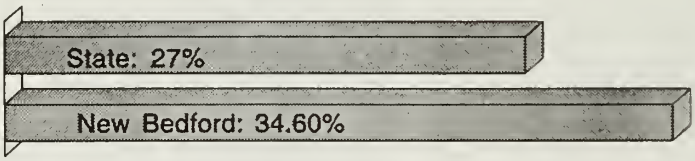


Per Capita Income (midpoint range)

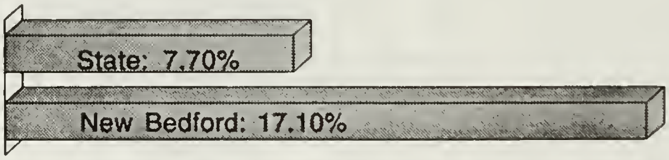


Income Types

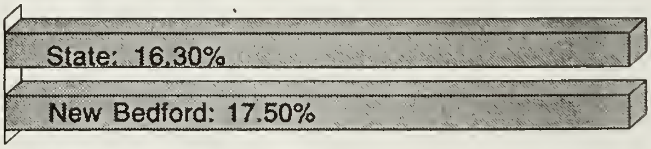
Receive Social Security Income



Receive Public Assistance Income

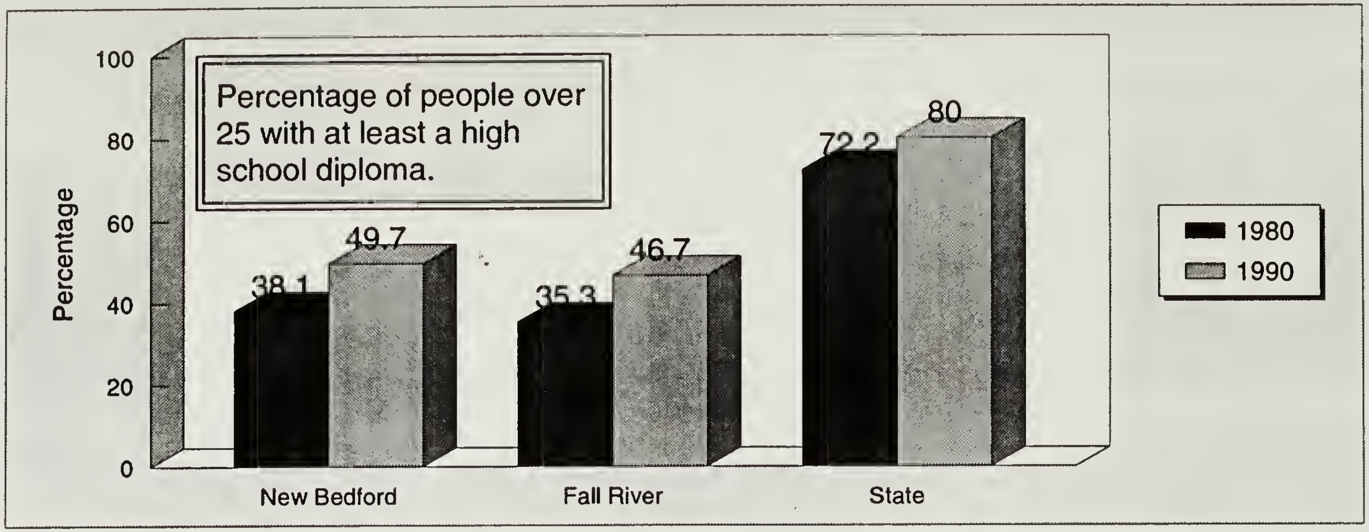


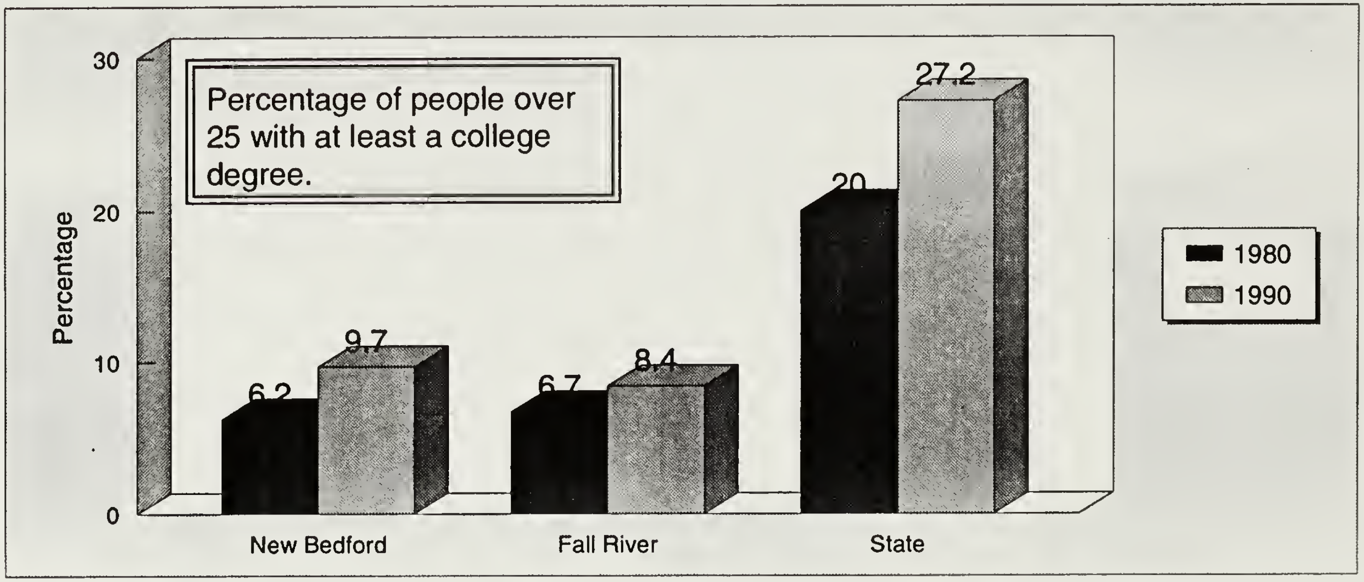
Retirement Income



Source: U.S Census Bureau

Still Behind in Education





Source: U.S. Census Bureau